# Pipe-shop automation with full software support from 3R in Germany

PIPES and tubes are a critical component for many structures and vehicles, and are therefore indispensable to modern society. Whether in plant construction, the automotive industry, petrochemicals, ship-building or the food or pharmaceutical industries, pipes are everywhere, meaning that there will always be demand to be fulfilled.

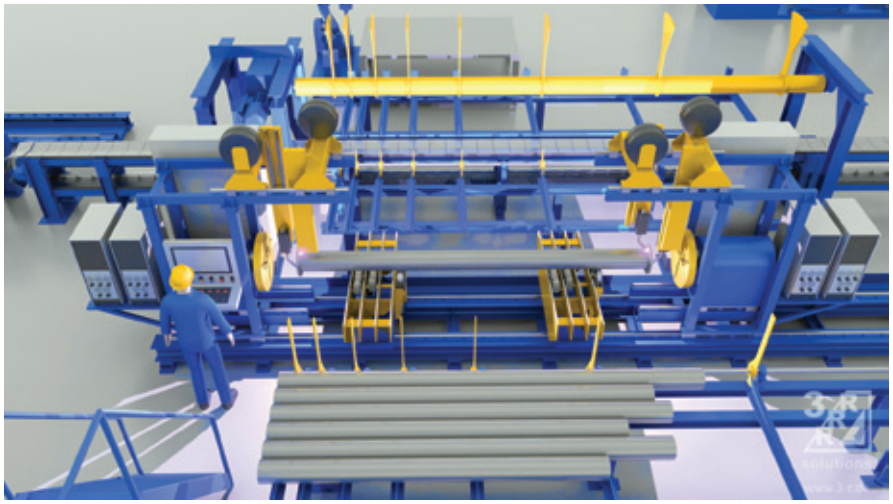
In order to meet this demand pipe-shops have become bigger, capable of fabricating high volumes of product. Machines have become more and more sophisticated and new processes are continuously being developed and refined. Whether CNC-controlled or fully robotic machines, there are many options and opportunities to increase output volumes.

The workflow inside a pipe-shop needs to be carefully planned and controlled, because it is vulnerable to a lot of factors that can affect output and productivity. Some of these factors, such as supply-chain management, are external to actual fabrication; others, such as bottlenecks caused by badly planned logistics inside the shop, are not.

Wrong decisions when first planning the pipe-shop can have significant repercussions once fabrication has actually started, so it is crucial to consider as many potential problems as possible before the first machine is purchased. Even if the fabrication part itself is perfectly organised and planned, the communication to engineering and warehousing has to be considered, as these departments are intrinsically tied to fabrication.

The company 3R solutions from Germany is an expert in the field of pipe-shop automation and optimisation. With more than 40 years of experience in planning and implementing pipe-shop projects all over the world, it has the expertise to help customers from diverse fields to identify the best way to build and operate their shop.

"The first step is an in-depth analysis," said managing director Georg Schulze-Duerr. "No two pipe-shops are the same, so you cannot have one or two simple standard solutions." Instead it is important to create a customised solution, based on input such as expected output volume, materials,



required procedures and tolerances, but most importantly a detailed breakdown of the dimensions to be processed. "A lot of customers approach us asking for a pipe-shop capable of producing a certain amount of tons or dia-inch per year, and give us a size range covering pipes from their smallest to their largest diameter," said Mr Schulze-Duerr.

"But a shop that fabricates 90 per cent stainless steel pipes from 2" to 16" will need completely different systems from a shop where 90 per cent of the fabrication are large bore carbon steel pipes of 24" and higher."

Once the breakdown of sizes and materials has been determined it is possible to select the best suited machines. Mr Schulze-Duerr said: "A pipe-shop is a little like a jigsaw puzzle. You need to select the right piece and put it in the right place, in order to get the big picture. If you just take some machines and put them into the shop without considering the effects on this big picture, you will run into trouble, because your flow of material will be a mess."

This flow of material is crucial to 3R's philosophy: "Two major cost drivers in spool fabrication are waiting times and transport costs, and the two are basically the same. My machine cannot work because it is waiting for material, and I need to pay people to bring this material from one machine or work place to the next. A machine for half a million euros may stand idle because I cannot move the pipes from another machine quickly enough. That machine may have to reduce its output as well, to give people a chance to remove the processed material. As a result two expensive machines are running at reduced capacity, while I have to schedule additional manpower for moving material between them."

An alternative used in 3R's pipe shops are automated transport systems, using roller and plate-belt conveyors as well as buffer tables. "No machine should ever have to wait for material, and no material should be double-handled," said Mr Schulze-Duerr. "Of course that also means that sometimes a machine has to be adjusted from the standard version so we can integrate it. Usually that means making it a little higher or adding a signal exchange so our system knows that a pipe can be loaded/received. The end result is a transport system that can run mostly autonomously."

Of course there are also different levels of automation, which can sometimes lead customers to have expectations that are not feasible or realistic. "When customers think about automation they sometimes fall into one of two traps," explained Mr Schulze-Duerr.

The one mistake many make is to rule out automation outright, because they think that their product is not suitable for it. "In a lot of industries you have a wide range of products, which are all fabricated in small batches, so customers think automation is not feasible for them, because there is no mass production. But this does not have to be the case, you can selectively automate specific

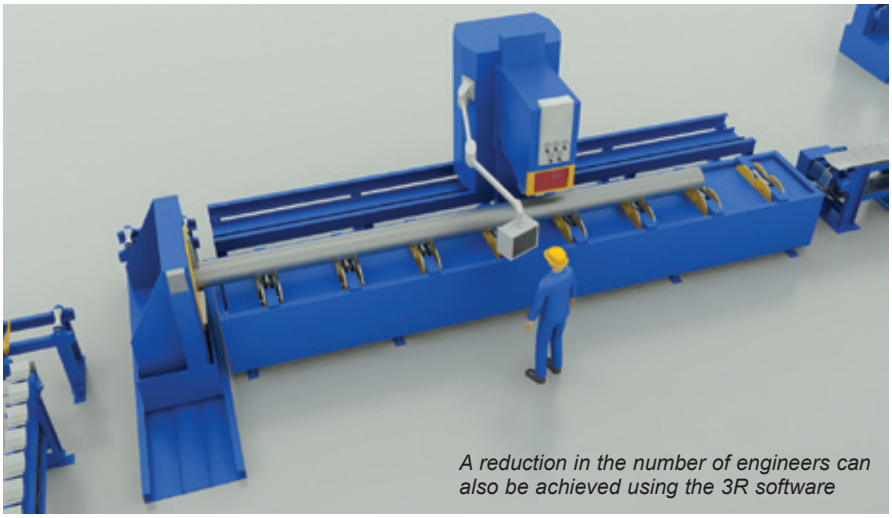
aspects of your fabrication and retain manual operations for others."

The other mistake is to think that by automating it is possible to cut out human interaction entirely. "Of course it would be nice to say I push one button, raw length of pipe go in on one side, and finished spools come out on the other one," said Mr Schulze-Duerr. "But this is not always possible, especially when you have the aforementioned small-batch production of thousands of different pieces. But again, by automating select processes it is possible to reduce man-power significantly, while using trained operators for those tasks that are too expensive or inconvenient to automate."

One of 3R's European customers said: "My product is different, so I thought that automation was not feasible for me. Then somebody introduced me to 3R and I realised that there are a lot of things that I can do to automate and improve. Now we managed to increase our capacities while spending less money and man-hours per unit."

3R solutions always strive to look for the optimal level of automation that is economically viable, rather than automating for its own sake. Mr Schulze-Duerr said: "At some point you have diminished returns. If for every euro I invest in automation I can achieve ten euros in savings, then of course I will do it without a second thought. But at some point every additional euro I spend only saves me five, so I start thinking about it a little harder. When every additional euro I spend saves me three later on, I think a lot harder. And once every euro I spend only saves me one euro or even less, I no longer have to think about it. Our job is to find the best combination of investment and savings."

While the actual product of each shop can vary significantly, there are some processes that are always the same, regardless of whether the shop produces brake lines for cars, handrails for staircases or the piping for entire cruise ships. "You need to move the pipe, you need to cut the pipe, and you need to bend or weld the pipe.



*A reduction in the number of engineers can also be achieved using the 3R software*

"Of course there are many additional and auxiliary processes, which are important, but these are the crucial ones. If I can automate transportation, I can ensure that my machines always have material. If I can streamline and optimise the cutting process I can save man-power and material. And I may not even need to automate in order to improve welding processes. If I introduce ergonomic fit-up stations and optimise by welding boxes, while using software to allocate material to these stations already in the warehouse."

One of 3R's customers from South-east Asia agreed. "Originally we brought all fittings into the pipe-shop in bulk, and the fitters had to go and get the material based on their work orders. This was very inefficient. Now they get their material on a single pallet directly to their work station, and as soon as they finish one job, they can immediately start the next one. Plus we can now track how much time they spend on each piece, giving us a great indicator of their performance."

Of course the real secret to savings, according to mr Schulze-Duerr, is not on the shop floor but on the administrative side. "If I can save ten people on the shop floor I have tangible, clearly apparent savings. But what if I can save three people in engineering, by introducing the right software? What if I can save a few hundred man-hours for purchasing, finance and warehousing?"

Mr Schulze-Duerr said: "I believe one of our strengths is that we can provide this full integration and with this go beyond the initial expectation of our customers. We have had the situation several times, where we had meetings with top level management which were supposed to be for thirty to sixty minutes, but which in the end ran for two to three hours, because we convinced them to look beyond the immediate savings on the shop-floor, but at the potential for improvement across the board. This allows them to contribute to the project constructively."

It is by combining this use of software with streamlined workflow that customers of 3R solutions have managed to achieve significant savings and favourable returns on investment. "One of our customers managed to reduce the man-power by 50 per cent. Software also allowed him to also reduce his production engineers by 90 per cent. Within a few years he had recouped his initial investment and he continues to save. In a peak year he saved 1.2 million US dollars just because of the software, not even considering the savings in fabrication time and man-power on the shop floor."

*3R strives to look at the optimal level of automation that is economically viable*

**3R solutions** – Germany
Website: www.3-r.de